Fifth Annual California Climate Change Conference
8-10 September 2008, Sacramento

Accounting for Potential GHG Benefits from Improved Fuels Management Practices on Forested Lands

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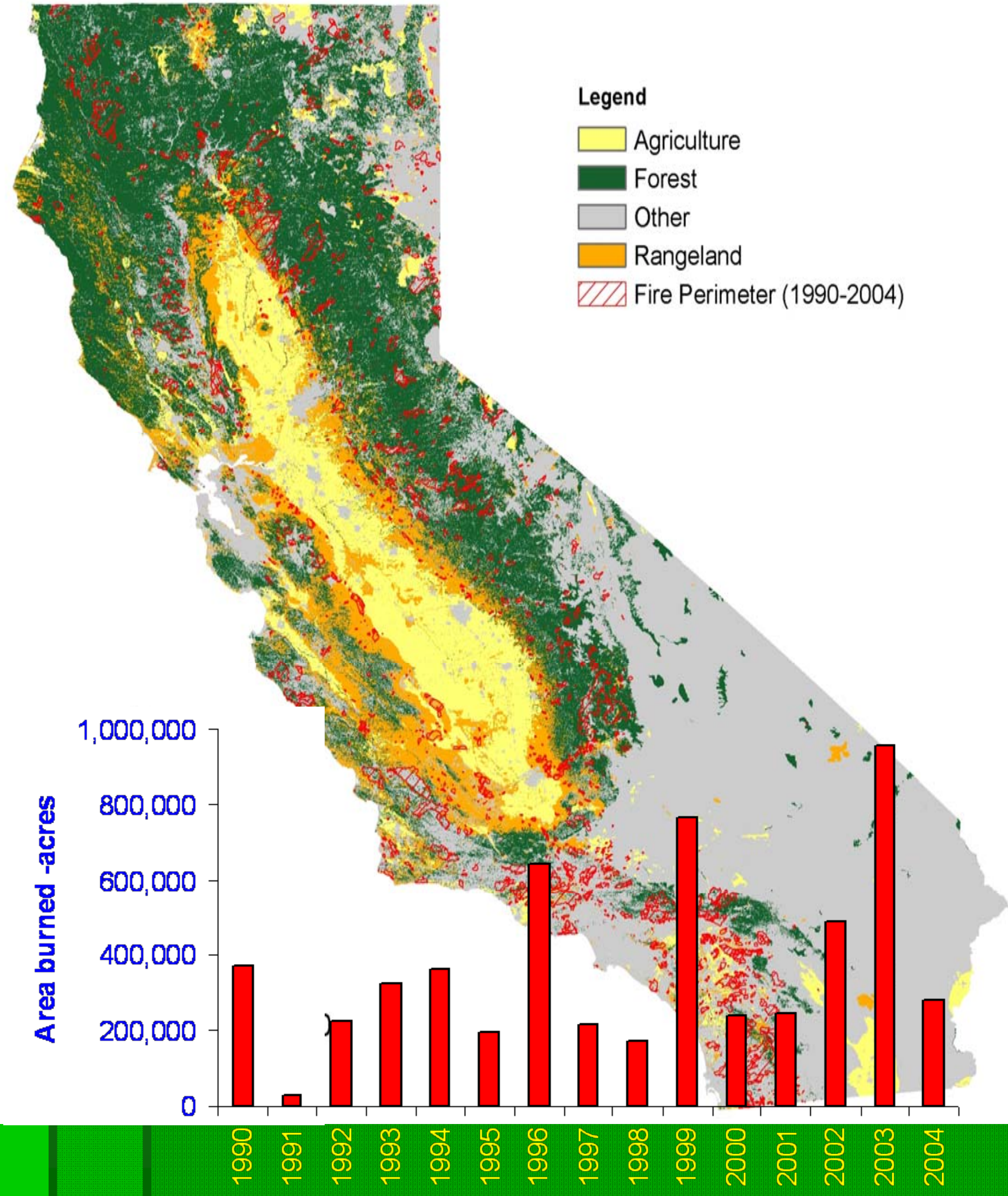


Fires in California

Total area burned in 1990-2004 = 5.5 million acres

Emissions from fires during period ~ 26 MMT CO_2 plus other GHGs

Costs of fighting increasing –more than $1 billion for country

Potential benefits from improved fuels management

Source: Sandberg, USDA Forest Service

- ✓ Reduce GHG emissions from loss of carbon stocks
- Reduce area burned
- Reduce fire severity
- Bring fire to the ground
- Increase growth rates in residual stand
- Decrease costs of fire fighting
- ✓ Offset fossil-fuel emissions

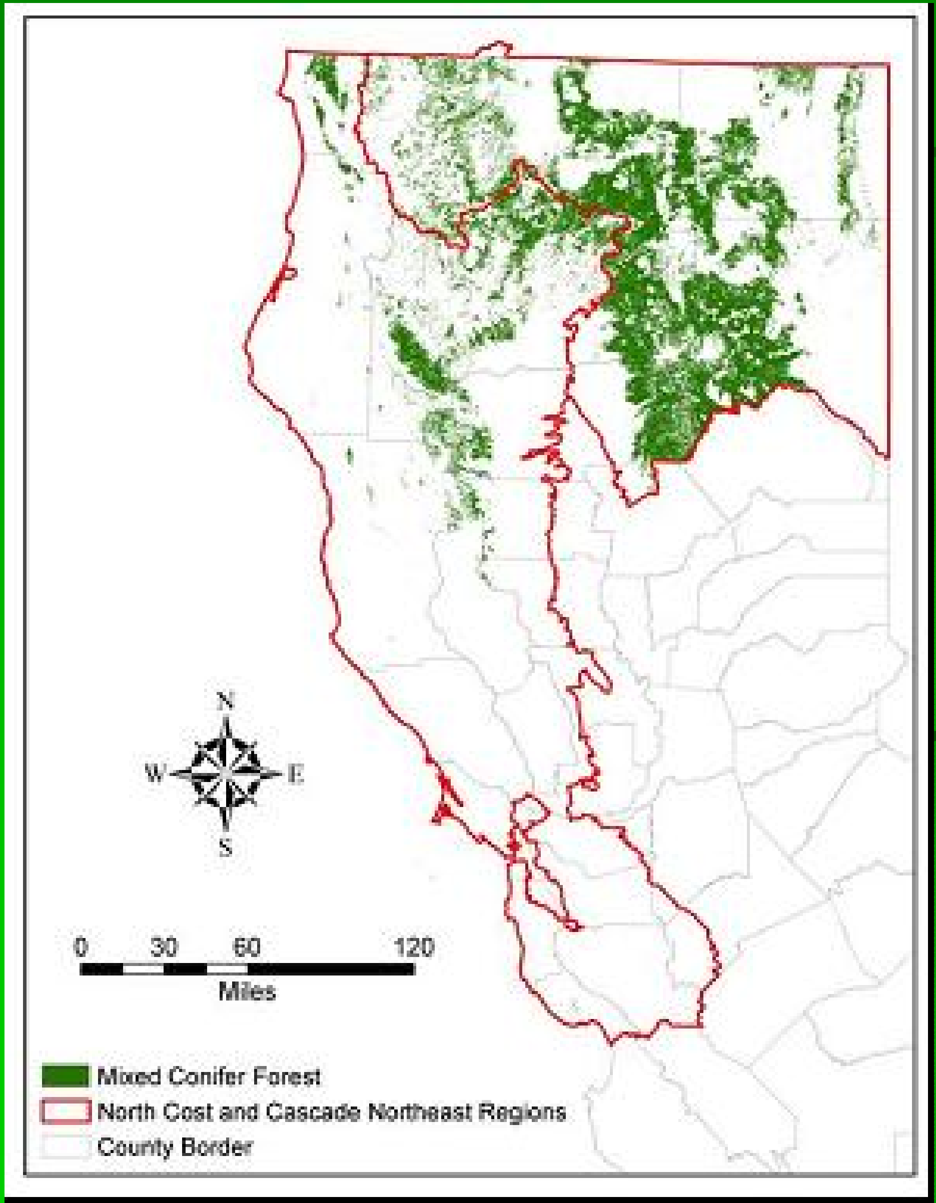
Overall goal of WESTCARB Fire Task

- Develop a methodology, at the project scale, for determining the net GHG benefits associated with improved management of hazardous fuels in forests susceptible to wildfires
  - The methodology must be cost-effective, practical, and transparent
  - The methodology would be able to qualify fuels management projects for the carbon offset market
  - Pilot test in two counties—Shasta, CA and Lake, OR

Acknowledge Fire Team

- All funding is from US DOE through CIEE/WESTCARB project
- Winrock: Tim Pearson and Nancy Harris
- Sam Sandberg
- Max Moritz and team, Center for Fire Research and Outreach, Berkeley
- Dave Saah & Dave Ganz, Spatial Informatics Group
- Mark Nechodom, USFS

Focus: area of mixed conifer forests at low to mid elevations



Forest historically had low to mixed severity fires and are good candidates for fuel treatments to restore their historical stand structure and fire regimes (Schoennagel et al. 2004).

How would a methodology for fuels treatment projects be created?

- What are the big issues:
  - Leakage - not really relevant—treating fuels to reduce fire severity in one place hardly likely to increase severity elsewhere
  - Permanence – need to re-treat
  - Additionality-definitely additional as not legally required or financial benefit

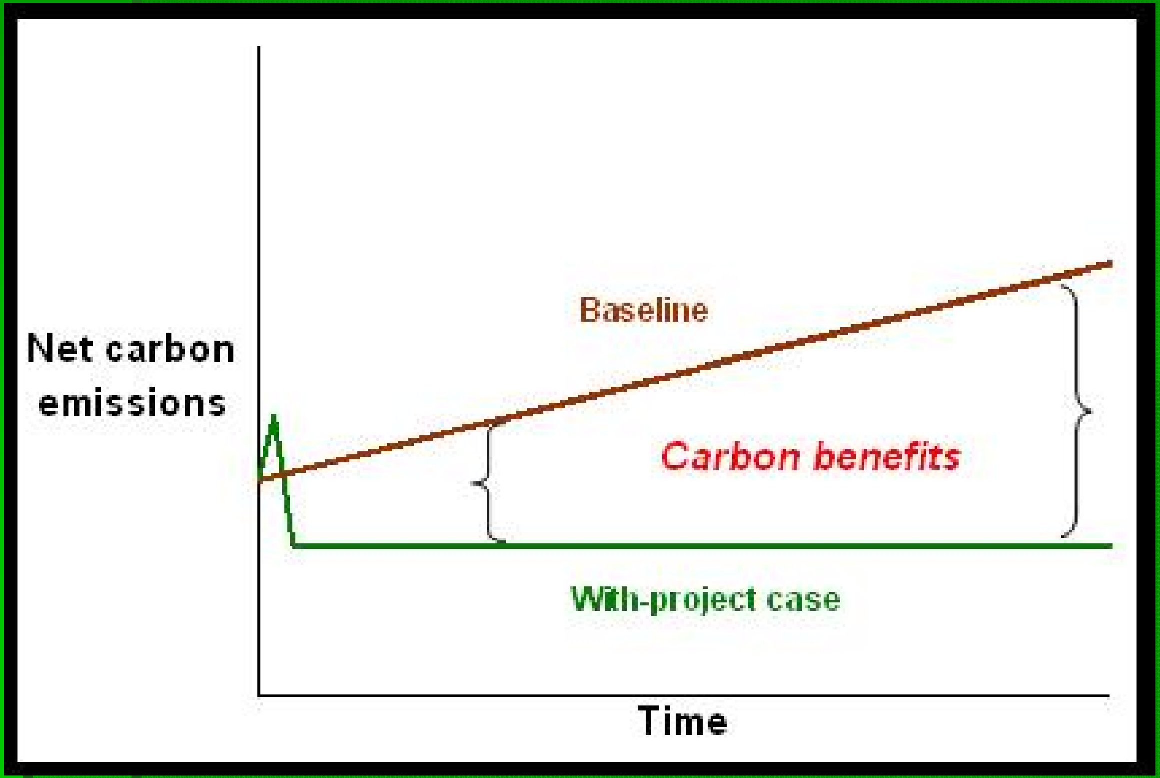
Real issue is:

  - BASELINE

Carbon accounting for land use change and forestry projects

- GHG benefits from a project is difference between a “baseline” and “with project case”

Project benefits-t CO_2 = Baseline emissions - Project emissions

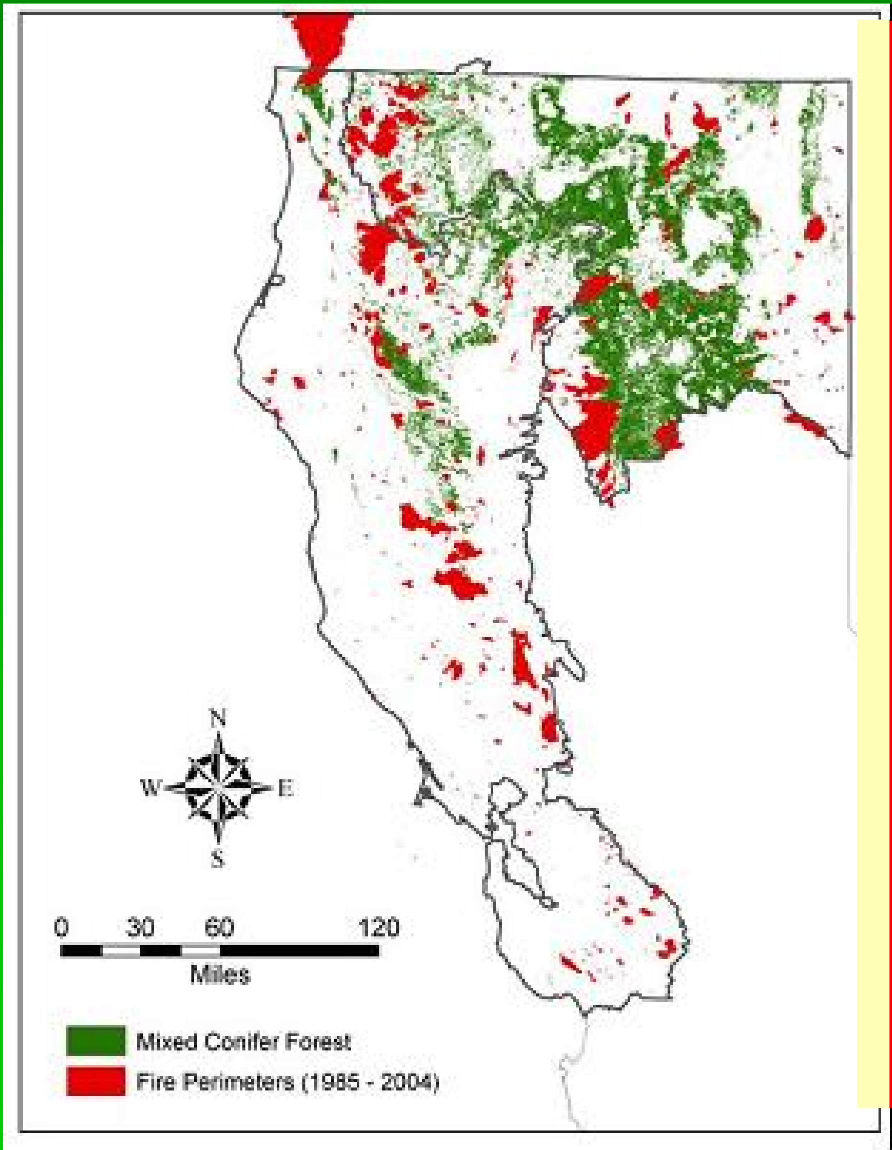


At project scale:
Baseline: emissions from “current” fire regime
Project: emissions associated with treatment to reduce fuels

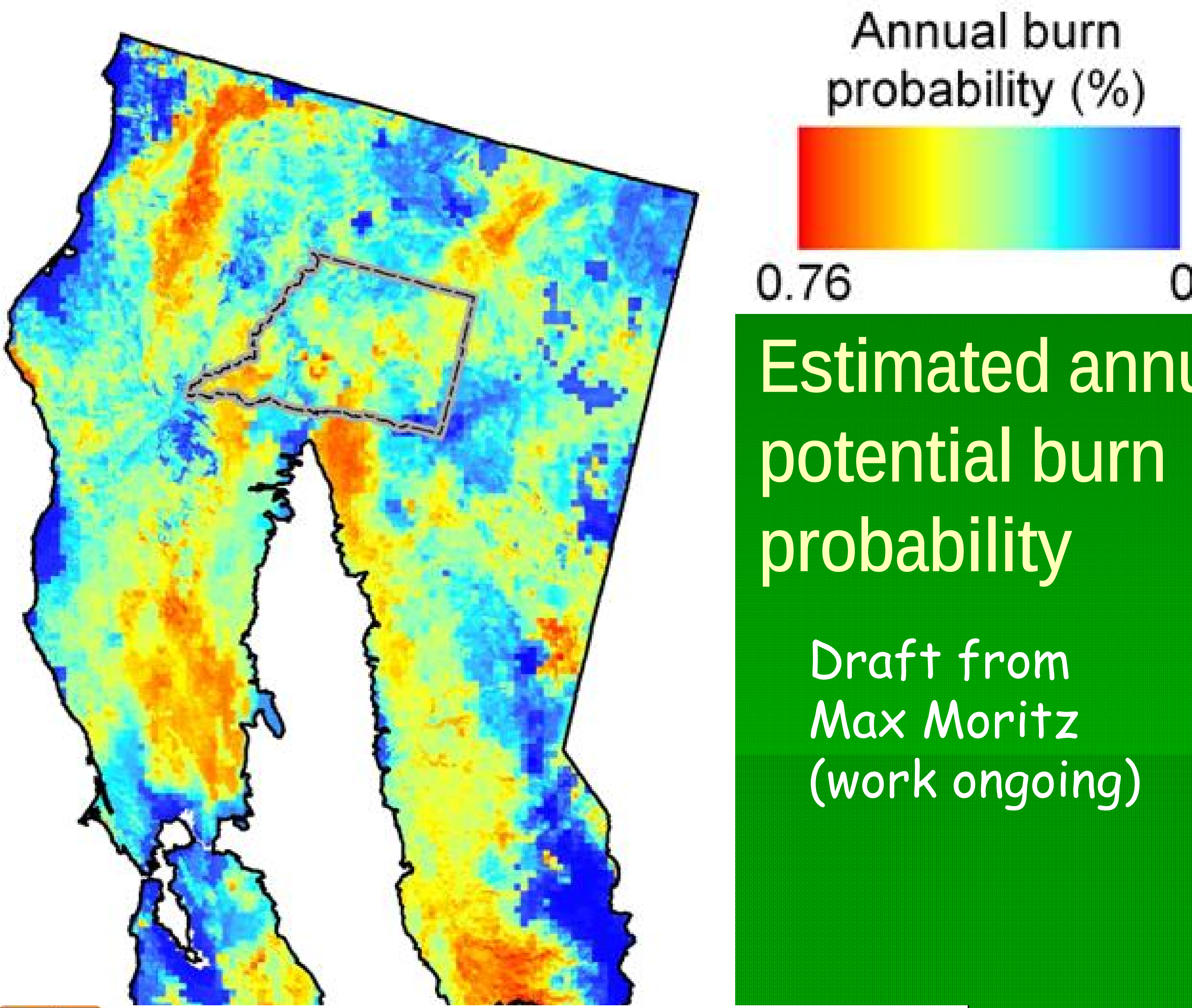
Baseline CO_2 emissions

- Area that would burn in forward projection based on past trends of risks or probabilities?
  - How far back and over how many years
  - Not readily modeled or estimated or able to predict well
- Impact on C stocks—related to intensity of fire (fire behavior), fuel loads, and forest recovery after fire
  - Many aspects can be measured, and emissions can be estimated well with robust models

Fire perimeters for North Coast and Cascades Northeast during 20 year period



Year	Area (ac) Public	Area (ac) Private	Percent Public	Percent Private
1985	1,863	367	0.070	0.019
1986	129	393	0.005	0.021
1987	83,344	4,272	3.116	0.224
1988	1,976	4,881	0.074	0.256
1989	400	379	0.015	0.020
1990	4,505	15,175	0.168	0.795
1991	314	818	0.012	0.043
1992	5,132	41,741	0.192	2.188
1993	81	1,013	0.003	0.053
1994	5,241	1,001	0.196	0.052
1995	103	0	0.004	0.000
1996	7,342	392	0.275	0.021
1997	79	39	0.003	0.002
1998	3,836	1,020	0.143	0.053
1999	13,670	5,547	0.511	0.291
2000	20,959	4,757	0.784	0.249
2001	16,906	4,345	0.632	0.228
2002	19,895	2,272	0.744	0.119
2003	1,988	3,016	0.074	0.158
2004	2,809	1,799	0.105	0.094
Total 20 years	190,573	93,228	---0.31---	



Estimated annual potential burn probability

Draft from Max Moritz (work ongoing)

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Project GHG Benefits

- Gain from decreased intensity or spread of fire due to fuel treatment
- + Gain from growth differences between with and without project and with and without fire
- + Loss from removal of fuel to biomass energy plant
- + Loss from removals of fuel to wood products (if applicable)
- + Loss from decomposition of additional dead wood stocks created through fuels treatment
- + Loss from fires occurring in with-project case
- + Loss from retreated stands through time

Case study for assessment of net emissions from fuel removal-Shasta County

Pretreatment		
452	t CO2e/ha	**trees**
81	t CO2e/ha	**litter**
2	t CO2e/ha	**understory/shrubs**
16	t CO2e/ha	**10 and 100 hr fuels**
92	t CO2e/ha	**1000 hr fuels**

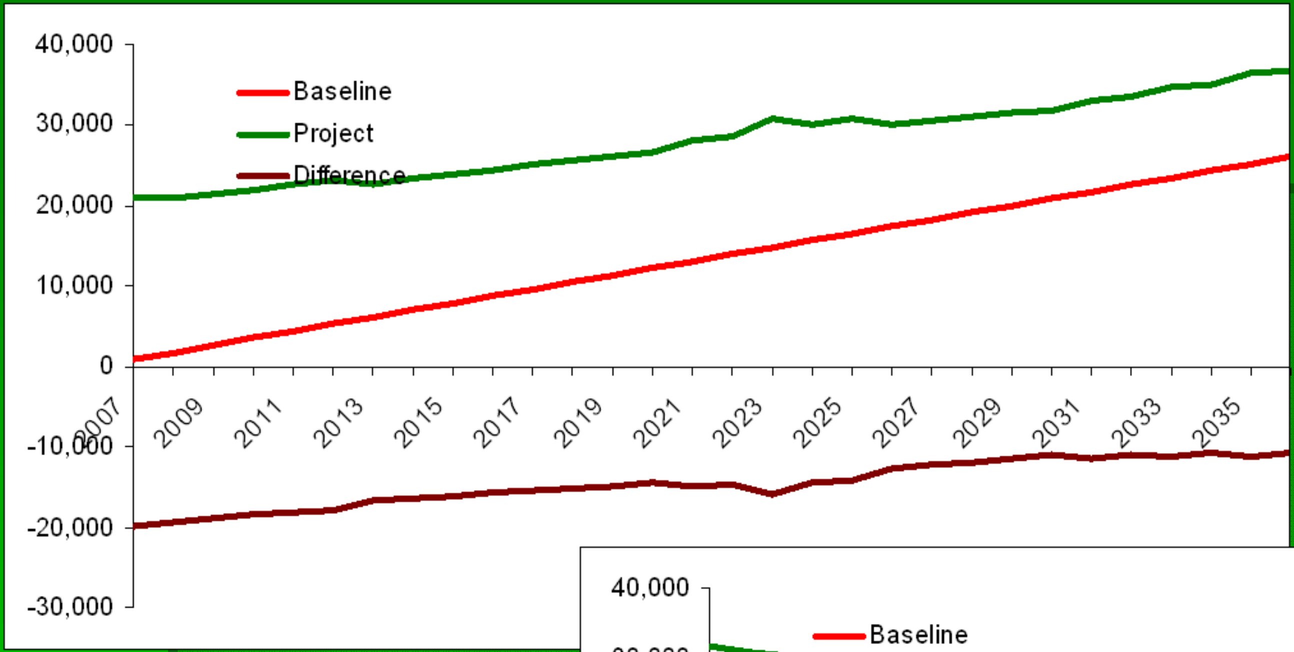
FROM FIELD MEASURE-MENTS ON THE SITE

Fire Risk		0.5	%
Treated area		324	ha
Percent cut during treatment		32.6%	
To commercial	23.0%	103.97	t CO2e/ha
To biomass	9.0%	40.68	t CO2e/ha
To deadwood	0.6%	2.71	t CO2e/ha
Dead wood decomposition rate		5%	

Severe fire assumed
60% of tree biomass volatilized
100% of 10-hr fuel, litter & understory volatilized
90% of biomass in 1000-hr fuels volatilized
Includes growth effects and retirement of wood products (using CCAR method)

Net emissions from fuel removed and burned in biomass energy plant= 1.334 t CO_2/t biomass
Natural gas=0.499 t CO_2/MWh
Biomass=1.833 t CO_2/MWh

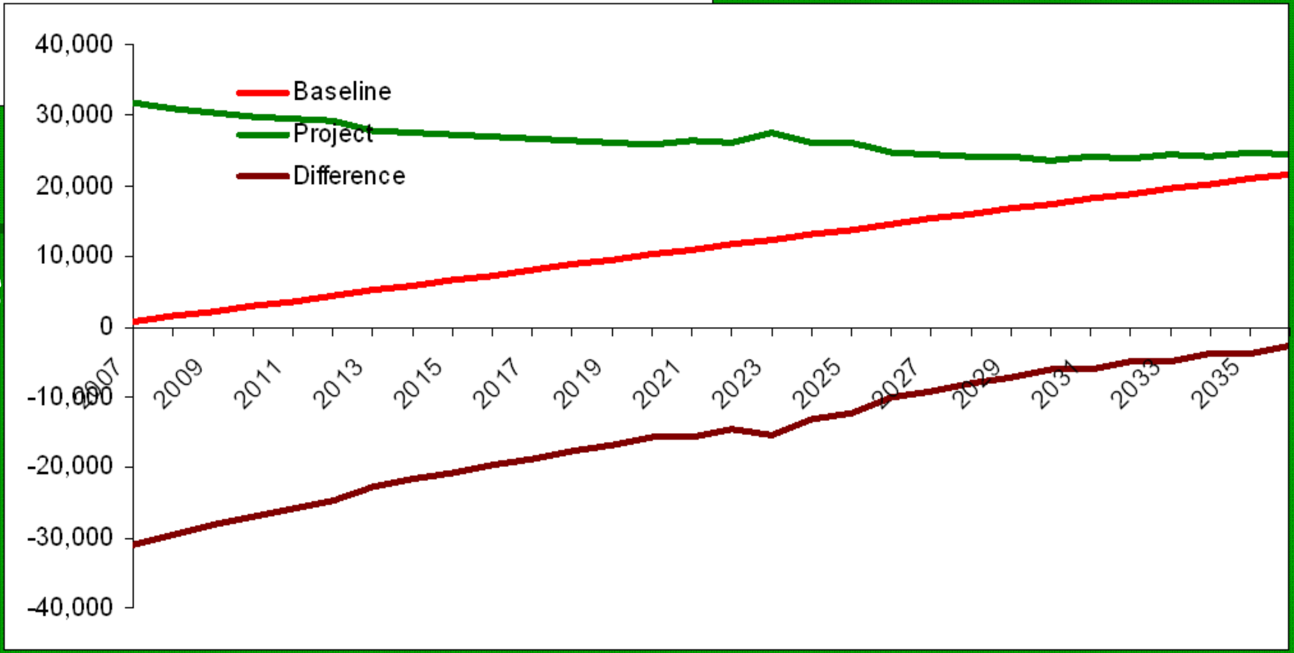
Projected net emissions fro fuel treatment



Actual disposition of biomass

23% to wood products

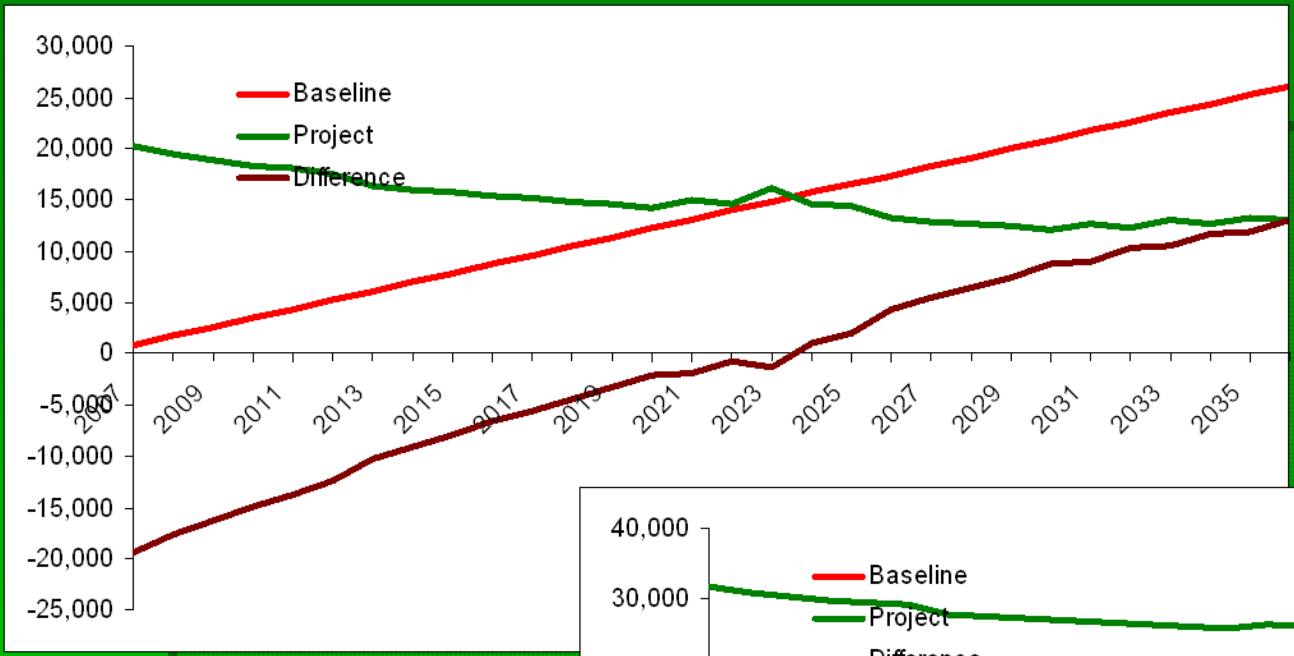
9% to biomass



0% to wood products

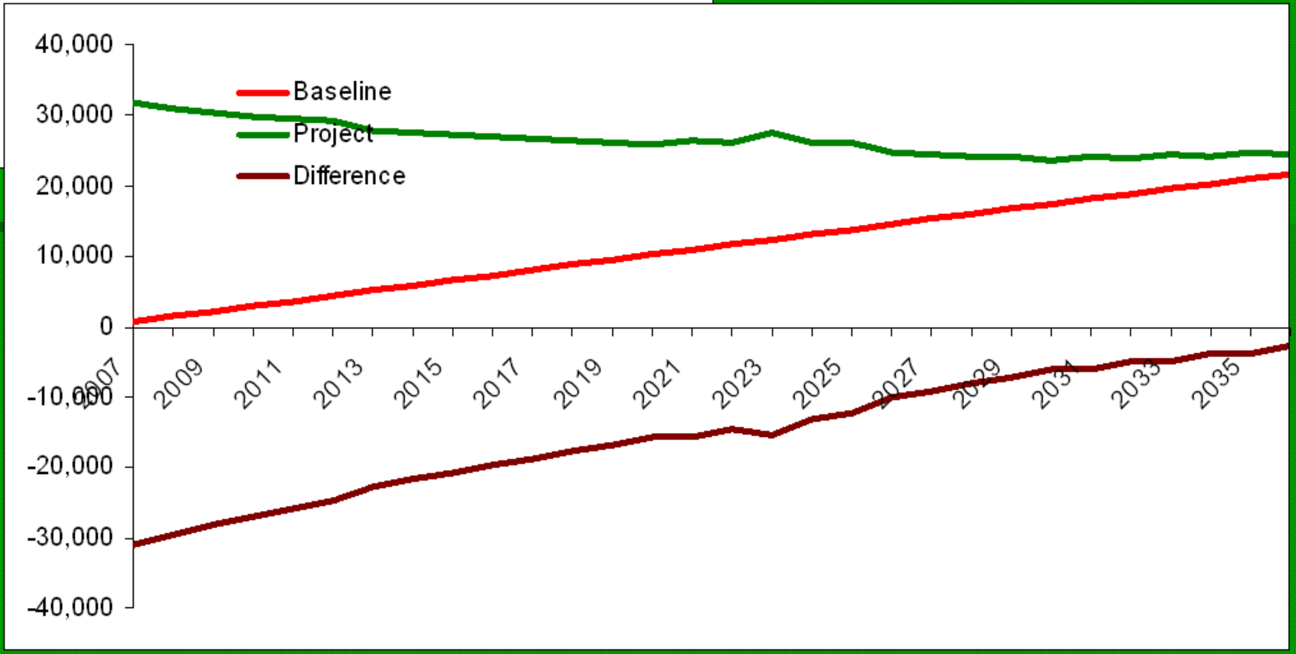
32% to biomass

Sensitivity of energy source replaced



32% to biomass

Replace coal



32% to biomass

Replace natural gas

Conclusions:

- Project: treatments leads to large emissions
  - Emissions across entire project area as opposed to 0.8% (maximum) of area burned per year in baseline
  - Shadow or multiplier effect – higher value makes project case more favorable
  - Growth advantage—not large
- Baseline emissions outweighed by project emissions under most reasonable and conservative assumptions
- Analysis suggests that project scale for HFR does not make sense for carbon projects

However…

- The constant baseline of % burned per yr is not really what happens
  - Treatment does not prevent fires; reduces intensity and spread
- Real project would have to take an emission with treatment and "hope" for a fire to receive benefit

What next?

- Work at a larger scale:
  - Strategically placed treatments to maximize risk of burning and shadow effect—how large can this effect be and under what conditions?
  - Treatments across counties or even state
    - Greatly increase probability that one or more treated areas will burn
- Ongoing work on these topics…..